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Application No.	Filing Date	Examiner	Group Art Unit
10/065,879	11/27/2002	Lund, Jeffrie Robert	1763

Invention: NON-PLASMA REACTION APPARATUS AND METHOD

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Newton *et al.*

Examiner: Lund, Jeffrie Robert

Serial No.: 10/065,879

Group Art Unit: 1763

Filed: 11/27/2002

Docket No.: **BUR9-2001-0144-US1**

Title: **NON-PLASMA REACTION APPARATUS AND METHOD**

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SUPPLEMENTAL APPEAL BRIEF OF APPELLANTS

This Supplemental Appeal Brief, pursuant to the Notification of Non-Compliant Appeal Brief dated October 24, 2005 and pursuant to the Office Action mailed April 5, 2005, is an appeal from the rejection of the Examiner dated April 13, 2004. The Appeal Brief filed on September 20, 2004 is incorporated , in its entirety, herein by reference. The present Supplemental Appeal Brief addresses the rejections of claims in the Office Action mailed April 5, 2005

REAL PARTY IN INTEREST

International Business Machines Corporation is the real party in interest.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF CLAIMS

Claims 1, 3-12, 17, 19 and 20 are currently pending. Claims 2 and 18 have been canceled. Claims 13-16 have been withdrawn. Claims 1, 3-12, 17, 19 and 20 have been rejected. This Brief is in support of an appeal from the rejection of Claims 1, 3-12, 17, 19 and 20.

STATUS OF AMENDMENTS

There are no After-Final Amendments which have not been entered. The Examiner withdrew the finality of the office action of April 13, 2004 because Claims 3 and 19 had not been rejected and the Examiner noticed that claims under appeal were not identical to the claims of record as a result of an After Final amendment that was filed on May 19, 2004 that was entered and contained amendments to intended by the Applicants. Therefore the finality of the office action of April 13 was withdrawn.

SUMMARY OF CLAIMED SUBJECT MATTER

The present invention discloses an apparatus, comprising a chamber adapted for holding a workpiece having a surface layer adapted for being etched. See Figs. 1-2 depicting a single-substrate-processing non-plasma reaction apparatus 10 and associated text in paragraph 33-34. The apparatus comprises a distribution plate including a first plurality of channels for providing a first fluid to flow into the chamber at an angle θ_1 with respect to an exposed surface of the distribution plate and a second plurality of channels for providing a second fluid to flow into the chamber at an angle 0_2 with respect to the exposed surface of the distribution plate, wherein the

first plurality of channels and the second plurality of channels are arranged in rings around a common point of the distribution plate, and wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees. See FIG. 2, paragraphs 35-40, and FIG. 5, and paragraph 51. In this embodiment of the apparatus, paths of the first plurality of channels and paths of the second plurality of channels originate in an XY plane of the distribution plate and each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees with respect to the XY plane. See FIG. 6B, and paragraph 52. In this embodiment of the apparatus, each angle θ_1 is offset from the XY plane at an offset angle α_1 and β_1 with respect to the XY plane. See FIGS. 5 and 6A, and paragraph 54. In this embodiment of the apparatus, each angle θ_2 is offset from the XY plane at an offset angle α_2 and β_2 with respect to the XY plane. See FIG. 6A, and paragraph 53. In this embodiment of the apparatus, α_1, β_1, α_2, and β_2 are selected from the group consisting of from about 0 to -45 and from about 0 to +45 degrees with respect to the XY plane. See FIG. 5 and 6A-6B, and paragraphs 53 and 54.

The present invention discloses a distribution plate of the apparatus that comprises a material selected from the group consisting of polytetrafluoroethylene, fluorinated ethylene propylene, acetyl homopolymer resin, polyimide, polyetherimide, polyarylate, polycarbonate, and combinations thereof. See FIG. 7 and paragraph 65.

The present invention discloses rings of the first and second types are advantageously concentric rings, wherein each ring has a diameter from about 1.75 inches to about 7.04 inches. See FIG. 2 and paragraphs 34-38.

The present invention discloses paths of the fluids through the distribution plate that comprise grooves and a volume of the grooves is advantageously greater than a volume of the

channels. See FIGS. 5, 6A and 6B and paragraphs 51-64.

The present invention discloses the rings around the center point of the distribution plate have shapes selected from the group consisting of circles, ellipses, rectangles, squares and combinations thereof. See paragraph 36.

The present invention discloses the chamber comprises a lower annular ring that includes a plurality of holes extending over an exhaust port. See FIG. 4, and paragraph 50.

The present invention discloses the chamber comprises an upper annular ring, wherein a space is created between an edge of the upper annular ring and a wall of the chamber, and wherein the space restricts a flow of fluids in the chamber. See FIG. 2, and paragraph 41.

The present invention discloses the opening between the upper annular ring and either the workpiece or the chamber wall is at least 3/8 inch. See FIG. 4, and paragraph 50. In certain embodiments, the distribution plate is located from about 1/8 inch to about 3 ½ inches from a surface of the workpiece. See FIG. 4, and paragraph 49.

The present invention discloses the first fluid comprises ammonia gas and the second fluid comprises hydrogen fluoride gas and the first fluid and the second fluid are adapted to react inside the chamber to form a self-limiting etchable layer on a portion of the adapted surface layer of the workpiece. See FIG. 4, and paragraph 49.

The present invention discloses a distribution plate comprising a first plurality of channels for providing a first fluid to flow into a chamber at an angle 0_1 with respect to an exposed surface of the distribution plate. See Figs. 1-2 depicting a single-substrate-processing non-plasma reaction apparatus 10 and associated text in paragraph 33-34. This embodiment comprises a second plurality of channels for providing a second fluid to flow into the chamber at

an angle θ_2 with respect to the exposed surface of the distribution plate, wherein the first plurality of channels and the second plurality of channels are arranged in rings around a common point of the distribution plate, and wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees. See FIG. 2, paragraphs 35-40, and FIG. 5, paragraph 51.

The present invention discloses the paths of the first plurality of channels and the second plurality of channels originate in an XY plane of the distribution plate and each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees with respect to the XY plane. See FIG. 6B and paragraph 52.

The present invention discloses each angle θ_1 is offset from the XY plane at an offset angle α_1 and β_1 with respect to the XY plane. See FIGS. 5 and 6A, and paragraph 54. In this embodiment of the distribution plate, each angle θ_2 is offset from the XY plane at an offset angle α_2 and β_2 with respect to the XY plane. See FIG. 6A and paragraph 53. In this embodiment, α_1, β_1, α_2, and β_2 are selected from the group consisting of from about 0 to -45 and from about 0 to +45 degrees with respect to the XY plane. See FIG. 5 and 6A-6B, and paragraphs 53 and 54.

The present invention discloses the first fluid is provided to the first plurality of channels and the second fluid is provided to the second plurality of channels without premixing of the first and second fluids. See FIG. 4 and paragraph 44.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether Claims 1, 3, 5-7, 9-12, 17, and 19-20 are unpatentable under 35 U.S.C. 103(a) over Mitani *et al. et al.* ("JP '780") in view of Deacon *et al.*, US Patent 5,792,269 ("U.S. '269").

2. Whether Claim 4 is unpatentable under 35 U.S.C. 103(a) over Mitani *et al.* ("JP '780") and Deacon *et al.*, US Patent 5,792,269 ("U.S. '269") as applied to Claims 1, 3, 5-7, 9-12, 17, and 19-20 above, and further in view of Plavidal *et al.*, US Patent 5,718,795 ("U.S. '795").

3. Whether Claim 8 is unpatentable under 35 U.S.C. 103(a) over Mitani *et al.* ("JP '780") and Deacon *et al.*, US Patent 5,792,269 ("U.S. '269") as applied to Claims 1, 3, 5-7, 9-12, 17, and 19-20 above, and further in view of Hasegawa *et al.*, US Patent 5,837,093 ("U.S. '093").

ARGUMENT

GROUND OF REJECTION 1

Claims 1, 3, 5-7, 9-12, 17, and 19-20 stand rejected under 35 U.S.C. 103(a) over Mitani *et al. et al.* ("JP '780") in view of Deacon *et al.*, US Patent 5,792,269 ("U.S. '269").

Claims 1, 5-7, 9-12, 17, and 20

The Examiner rejected Claims 1, 5-7, 9-12, 17, and 20 under 35 U.S.C. 103(a) as allegedly being unpatentable over Mitani *et al.* ("JP '780") and Deacon *et al.*, US Patent 5,792,269 ("U.S. '269"). Appellants respectfully contend the Examiner's rejection of Claims 1, 5-7, 9-12, 17, and 20 is improper because there is no motivation to combine JP '780 and U.S.

'269. Firstly, Appellants contend that without sidewalls, step coverage is irrelevant to Mitani *et al.* Mitani *et al.* do not teach structures having **sidewalls** as do Deacon *et al.* See Mitani *et al.* generally, in particular the Industrial Field of Application (stating "[t]he present invention related to a CVD device, in particular an in vacuo CVD device that can form a good film having in-plane uniformity within a wide range of pressures.").

Moreover, Appellants respectfully contend that the Examiner has created a reason for the combination, i.e., allegedly improving the channels of Mitani *et al.* by improving the step coverage as taught by Deacon *et al.*, that the Examiner has not supported by any cited prior art. See the office action, pages 5-6, paragraph 5, stating ("Deacon *et al.* teaches replacing a distribution plate having vertical channels with a distribution plate having angled channels and suggests that this change will improve the step coating of the deposition apparatus."). See also the office action, page 3, third paragraph, (stating "[t]he motivation for angling the channels of Mitani *et al.* is to improve **step coverage** as taught by Deacon *et al.*" (emphasis added)).

Secondly, the Examiner has not identified any teaching or suggestion or motivation in the prior art for combining planar coverage and step coverage in one apparatus in order to optimize the gas distribution plate for each method.

Thirdly, the Examiner has not identified any teaching or suggestion or motivation in the prior art for combining planar coverage and step coverage in one apparatus in order that each deposition or etching apparatus can be used for many different processes.

Referring to Appellants' second and third arguments, the Examiner argues "it is generally known that the gas distribution plate is dependent on each method performed in a deposition or etching apparatus, and the gas distribution plate must be optimized for each

method; and that each deposition or etching apparatus can be used for many different processes." The office action, page 6, paragraph 5. Appellants respectfully contend the Examiner has not presented evidence showing that Deacon's single gas distribution faceplate, reducing the three types of gas systems of Mitani *et al.* to one, can be optimized or can be used for many different processes other than sidewall step coverage without destroying Mitani's excellent +/- 3% planar coverage.

Appellants submit that Deacon *et al.* distinguishes itself from Mitani *et al.* because it discloses that the invention produces as much as a 35% improvement in **sidewall step coverage** as compared to prior art processes (see Fig. 1) where gas flow is directed perpendicular to the surface of the wafer, as in Mitani *et al.* See Deacon *et al.*, Column 3, lines 23 - 26. However, nowhere does Deacon *et al.* teach that the angled jets of fluid would not destroy Mitani's excellent +/- 3% planar coverage. In fact, Deacon *et al.* is silent regarding the effect of the angled jets of fluid on uniformity of planar coverage. See Deacon *et al.*, Table 1, showing no uniformity of planar coverage heading.

Regarding Appellants' second argument, the Examiner's created reason that Appellants contend is not supported in the Examiner's cited prior art includes that one skilled in the art would be motivated to **optimize the gas distribution plate for each method** "to angle the holes of Mitani *et al.* as taught by Deacon *et al.*, thus enabling the apparatus of Mitani *et al.* to perform both planar coating and step coating methods" (emphasis added). The Office Action, page 6, paragraph 5. The Examiner acknowledges that Mitani *et al.* do not teach structures having **sidewalls** as do Deacon *et al.*, and that Deacon *et al.* is directed to improving step coverage. Appellants respectfully submit step coverage is totally unnecessary in Mitani *et al.*, as the

Examiner acknowledged Mitani *et al.* is directed to planar coatings. Therefore, step coating is irrelevant to Mitani *et al.* and accordingly cannot be optimized or used in Mitani's disclosed invention.

Regarding Appellants' third argument, Appellants submit that Mitani *et al.* teach forming an "average film thickness of 3320 Å with an in-plane distribution of +/-3% or less formed on a 5-inch diameter Si wafer. Mitani *et al.*, page 6, Section 3, Working Example 1, paragraph 4, lines 6-8. Moreover, Appellants submit that Deacon *et al.* depict a **sidewall** in FIG. 1 as a metal line that is orthogonal to a planar surface such as depicted as 22a, 22b, and 22c. See U.S. '269, FIG. 1 and column 2, lines 57-67 and column 3, lines 1-9. In contrast, Mitani *et al.* teach a CVD apparatus that can form a good film having in-plane uniformity **within a range of pressures**" (emphasis added). Translation of JP '780, page 3, Section 3, Industrial Field of the Application. Nowhere does Deacon *et al.* teach forming a planar coating having an average film thickness of 3320 Å with a +/-3% or less in-plane distribution or a CVD apparatus that forms a good film having in-plane uniformity **within a range of pressures**. See Deacon *et al.* generally.

The Examiner's combination of Mitani *et al.* and Deacon *et al.* is improper because the Examiner has not supplied a legally persuasive argument as to why a person of ordinary skill in the art would modify Mitani *et al.* by the teaching of Deacon *et al.* in relation to Claims 1, 5-7, 9-12, 17, and 20. In particular, established case law requires that the prior art must contain some suggestion or incentive that would have motivated a person of ordinary skill in the art to modify a reference or to combine references. See Karsten Mfg. Corp. V. Cleveland Gulf Co., 242 F.3d 1376, 58 U.S.P.Q.2d 1286, 1293 (Fed. Cir. 2001 ("In holding an invention obvious in view of a combination of references, there must be some suggestion, motivation, or teaching in the prior art

that would have led a person of ordinary skill in the art to select the references and combine them in a way that would produce the claimed invention."). See also In re Gordon, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984 ("The mere fact that the prior art could be so modified would not have made the motivation obvious unless the prior art suggested the desirability of the modification."). Appellants maintain that the Examiner has not made any showing that the prior art suggests that angling the holes of Mitani *et al.*, as taught by Deacon *et al.*, **is optimizable or usable**, because the apparatus of Mitani *et al.*, having three gas types, would be optimizable or be able to perform both planar coating and step coating methods if it had angled channels, as alleged by the Examiner. Thus, the Examiner has created a reason for the combination that the Examiner has not supported by the cited prior art. By not citing any suggestion or incentive in the prior art for improving sidewall step coverage in the invention of Mitani *et al.*, the Examiner has failed to establish a *prima facie* case of obviousness in relation to Claims 1, 5-7, 9-12, 17, and 20.

In light of the foregoing, Appellants contend that the Examiner's use of Deacon *et al.*, to modify Mitani *et al.* is improper, because Deacon *et al.* do not teach **optimization or use of the gas distribution plate for each method** over Mitani *et al.* because Deacon *et al.* do not solve a problem that exists in Mitani *et al.*, as evidenced by the fact that Mitani *et al.* do not teach a need for **sidewall step coverage**, thus making Deacon's angled channels totally unnecessary to modify Mitani *et al.* Appellants respectfully submit Claims 1, 5-7, 9-12, 17, and 20 are in condition for allowance under 35 U.S.C. 103(a) because the Examiner's rejection is based on an improper combination.

Claims 3 and 19

The Examiner rejected Claims 3 and 19 under 35 U.S.C. 103(a) as being allegedly unpatentable over Mitani *et al.* ("JP '780") and Deacon *et al.*, US Patent 5,792,269 ("U.S. '269"). Appellants contend that Claims 3 and 19 are not unpatentable because Mitani *et al.* ("JP '780") and Deacon *et al.*, US Patent 5,792,269 ("U.S. '269") do not teach the following features of Claims 3 and 19:

> "wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees **with respect to** the XY plane and wherein each angle θ_1 is offset **from the XY plane** at an offset angle α_1 and β_1 **with respect to** the XY plane, and wherein each angle θ_2 is offset **from the XY plane** at an offset angle α_2 and β_2 **with respect to** the XY plane, and wherein α_1, β_1, α_2, and β_2 are selected from the group consisting of from about 0 to -45 and from about 0 to +45 degrees **with respect to** the XY plane,"(Emphasis Added).

Appellants submit that Claims 3 and 19 require that each angle θ_1 and θ_2 be offset **from the XY plane** by offset angles α_1 and β_1 and α_2 and β_2, respectively. Appellants' specification states that FIG 6A depicts FIG. 6B, wherein three dimensional XYZ axes are superimposed on the front cross-sectional view of the distribution plate **40** depicted in FIG. 6B. In FIG. 6A, the XY plane is a front cross-sectional view of the distribution plate **40**, and the right triangle ABO is in the XY plane. The line AB of the right triangle ABC is also in the XY plane. However, Appellants' specification states that the line or path **175** of the channels of the second type **5** from the distribution plate **40** may be offset by an angle DAC **215** equal to α_2 **with respect to** the plane XY as it exits the surface **43**. In like manner, Appellants' specification states that the line or path **175** of the channels of the second type **5** from the distribution plate **40** may be offset by an angle BAC **220** equal to β_2 **with respect to** the plane XY as it exits the surface **43**.

Appellants' specification states the offset angles α_2 and β_2 **with respect to** the XY plane may be from about 0 to -45 and about 0 - +45 degrees **with respect to** the XY plane of the cross-sectional view.

Referring to FIG. 5 and paragraph 54 of Appellants' specification, and by analogy to the offset of the line or path **175** by the offset angles α_2 and β_2, the line or path **162** from the channels **3** of the first type may be offset **from the XY plane** of the cross-sectional view of the distribution plate **40** by α_1 and β_1. The offset angles α_1 and β_1 may be from about 0 to -45 degrees and about 0 - +45 degrees **with respect to** the XY plane of the cross-sectional view of the distribution plate **40**. See Appellants' specification, paragraph 54.

Therefore, the offset angles α_1 and β_1 and α_2 and β_2 of Claims 3 and 19 is **with respect to** the XY plane and thus must extend into a *Z* dimension, which is a third dimension along the *Z* axis of the XYZ coordinates.

The Examiner stated that Deacon *et al.* teaches "various hole patterns one of which includes a flow at an angle of 45 to less than 90 degrees (i.e. 72°) **with respect to** the XY plane, and the flow path is offset **from the XY plane** at an offset angle ∀ and ∃ (sic) (as defined in the Applicants' specification in paragraph 53) at a range of angles 0 to ± 45° (See FIG. 19)" The Office Action, page 3, paragraph 2.

Appellants' respectfully submit that the angle of 45 to less than 90 degrees (i.e. 72°) **with respect to** the XY plane of the distribution plate of Deacon *et al.* could not be the offset angles α_1 and β_1 and α_2 and β_2 of Claims 3 and 19 because FIG. 19 of Deacon *et al.* only teaches two dimensions. FIG. 19 of Deacon *et al.* only teaches the bottom surface of the distribution plate

which is perpendicular to the XY plane of Deacon's distribution plate. Nowhere does Deacon *et al.* teach or suggest offset angles with respect to the XY plane.

Deacon *et al.* describes that FIG. 19 "shows a hole pattern with alternating directions of holes adjacent one another." Deacon *et al.*, column 8, lines 54 - 56. Nowhere in FIG. 19 or its description does Deacon teach or suggest any plane other than the surface of the distribution plate. Further, the only directions Deacon discloses are "alternating directions of holes adjacent one another" in the surface of the distribution plate. Id. Deacon does not disclose the orientation of FIG. 19 **with respect to** the wafer or substrate. Appellants respectfully contend that Deacon *et al.* is incapable of teaching or suggesting the offset angles of Claims 3 and 19 because generally Deacon *et al.* only teaches or suggest one plane or two dimensions in all its FIGS. and disclosure.

Appellants respectfully submit that contend that the Examiner has not presented an argument directed to the preceding requirements of Claims 3 and 19. The Examiner maintains Deacon *et al.* teaches Appellants offset angles α_1 and β_1 and α_2 and β_2 of Claims 3 and 19 yet FIG. 19 of Deacon *et al.* only teaches two dimensions.

Thus, Appellants contend that the Examiner has not satisfied his burden to prove a *prima facie* case of obviousness in relation to Claim 3 and 19. Accordingly, Appellants contend that the rejection of Claims 3 and 19 is improper.

In light of the foregoing discussion, Appellants respectfully submit that Claims 3 and 19 are in condition for allowance under 35 U.S.C. 103(a).

GROUND OF REJECTION 2

Claim 4 is not unpatentable under 35 U.S.C. 103(a) over Mitani *et al.* ("JP '780") and Deacon *et al.*, US Patent 5,792,269 ("U.S. '269") as applied to Claims 1, 3, 5-7, 9-12, 17, and 19-20 above, and further in view of Plavidal *et al.*, US Patent 5,718,795 ("U.S. '795")

Claim 4

The Examiner rejected Claim 4 under 35 U.S.C. 103(a) as being allegedly unpatentable over Mitani *et al.* and Deacon *et al.*, as applied to Claims 1, 3, 5-7, 9-12, 17, and 19-20 above, and further in view of Plavidal *et al.*, US Patent 5,718,795 ("U.S. '795"). Appellants respectfully contend the Examiner's rejection of Claim 4 is improper because of lack of motivation to combine Mitani *et al.* in view of Deacon *et al.* with Plavidal *et al.* The Examiner states the motivation is to provide a chemically inert material of construction. See the Final Office Action, page 6, paragraph 10. Appellants respectfully dispute that the motivation to combine Mitani *et al.* and Deacon *et al.* with Plavidal *et al.* is the need to provide a chemically inert material of construction, because, nowhere do Mitani *et al.* or Deacon *et al.* teach or suggest that the distribution plate requires a chemically inert material of construction. See Mitani *et al.* or Deacon *et al.* generally. In fact, as the Examiner acknowledges, a material of construction is not disclosed by Mitani *et al.* and Deacon *et al.* See the Office Action, Id. Appellants respectfully submit that the Examiner's rejection of Claim 4 fails because nowhere do Mitani *et al.* in view of Deacon *et al.* teach that the distribution plate requires a chemically inert material of construction.

Appellant respectfully contends that Claim 4 is in condition for allowance under 35 U.S.C. 103(a) because the prior art cited by the Examiner does not provide a motivation for combining Mitani *et al.* and Deacon *et al.* with Plavidal *et al.*

GROUND OF REJECTION 3

Claim 8 is not unpatentable under 35 U.S.C. 103(a) over Mitani *et al.* ("JP '780") and Deacon *et al.*, US Patent 5,792,269 ("U.S. '269") as applied to Claims 1, 3, 5-7, 9-12, 17, and 19-20 above, and further in view of Hasegawa *et al.*, US Patent 5,837,093 ("U.S. '093")

Claim 8

The Examiner rejected Claim 8 under 35 U.S.C. 103(a) as being allegedly unpatentable over Mitani *et al.* and Deacon *et al.*, as applied to Claims 1, 3, 5-7, 9-12, 17, and 19-20 above, and further in view of Hasegawa *et al.*, US Patent 5,837,093 ("U.S. '093"). Appellants respectfully contend the Examiner's rejection of Claim 8 is improper because of lack of motivation to combine Mitani *et al.* in view of Deacon *et al.* with Hasegawa *et al.* The Examiner states the motivation to modify Mitani *et al.* in view of Deacon *et al.* with Hasegawa *et al.* is to improve the uniformity of flow across the wafer and to the exhaust port, thereby improving the uniformity of the processed wafer." Firstly, Appellant traverses the Examiner's argument, submitting that nowhere does Hasegawa *et al.* teach "a lower annular ring that includes a plurality of holes extending over an exhaust port," as in Appellants' Claim 8, to improve the uniformity of flow across the wafer and to the exhaust port, thereby improving the uniformity of the processed wafer." Hasegawa *et al.*, column 3, lines 17-18, (stating "the lower electrode 23 is surrounded by a baffle plate 29, which has a plurality of through holes 30. An exhaust pipe 31 is connected to one side of the reaction chamber 11."). Instead, Hasegawa *et al.* teaches high speed etching using "an etching inhibiting gas." Hasegawa *et al.*, column 4, lines 56-57. Nowhere does Hasegawa *et al.* teach a motivation for the plurality of through holes, except for exhausting the etching inhibiting gas. Secondly, although the Examiner states the motivation to modify Mitani *et*

al. in view of Deacon *et al.* with Hasegawa *et al.* is to improve the uniformity of flow across the wafer and to the exhaust port, thereby improving the uniformity of the processed wafer," Thirdly, Appellants traverse the Examiner's rejection of Claim 8 as allegedly unpatentable, reiterating their argument stated under Issue 1 that the Examiner has not provided a legally persuasive argument that one skilled in the art would be motivated to look to Hasegawa *et al.* to improve Mitani's excellent +/- 3% planar coverage.

Appellant respectfully contends that Claim 8 is in condition for allowance under 35 U.S.C. 103(a) because the prior art cited by the Examiner does not provide a motivation for combining Mitani *et al.* and Deacon *et al.* with Hasegawa *et al.*

In summary, Appellants respectfully request reversal of the 35 U.S.C. 103(a) rejections of 1, 3-12, 17, 19 and 20.

The Director is hereby authorized to charge and/or credit Deposit Account No. 09-0456.

Respectfully Submitted,

Date: October 27, 2005

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Newton *et al.* Examiner: Lund, Jeffrie Robert

Serial No.: 10/065,879 Group Art Unit: 1763

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Title: **NON-PLASMA REACTION APPARATUS AND METHOD**

Commissioner for Patents
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APPENDIX A - CLAIMS ON APPEAL

In The Claims

1. An apparatus comprising:

a chamber adapted for holding a workpiece having a surface layer adapted for being etched; and

a distribution plate including a first plurality of channels for providing a first fluid to flow into the chamber at an angle θ_1 with respect to an exposed surface of the distribution plate and a second plurality of channels for providing a second fluid to flow into the chamber at an angle θ_2 with respect to the exposed surface of the distribution plate, wherein the first plurality of channels and the second plurality of channels are arranged in rings around a common point of the distribution plate, and wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees.

3. The apparatus of claim 1, wherein paths of the first plurality of channels and paths of the second plurality of channels originate in an XY plane of the distribution plate and wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees with respect to the XY plane and wherein each angle θ_1 is offset from the XY plane at an offset angle α_1 and β_1 with respect to the XY plane, and wherein each angle θ_2 is offset from the XY plane at an offset angle α_2 and β_2 with respect to the XY plane, and wherein α_1, β_1, α_2, and β_2 are selected from the group consisting of from about 0 to -45 and from about 0 to +45 degrees with respect to the XY plane.

4. The apparatus of claim 1, wherein the distribution plate comprises a material selected from the group consisting of polytetrafluoroethylene, fluorinated ethylene propylene, acetyl homopolymer resin, polyimide, polyetherimide, polyarylate, polycarbonate, and combinations thereof.

5. The apparatus of claim 1, wherein the rings of the first and second types are concentric rings, wherein each ring has a diameter from about 1.75 inches to about 7.04 inches.

6. The apparatus of claim 1, wherein paths of the fluids through the distribution plate further comprises grooves and wherein a volume of the grooves is greater than a volume of the channels.

7. The apparatus of claim 1, wherein the rings around the center point of the distribution plate have shapes selected from the group consisting of circles, ellipses, rectangles, squares and combinations thereof.

8. The apparatus of claim 1, wherein the chamber further comprises a lower annular ring that includes a plurality of holes extending over an exhaust port.

9. The apparatus of claim 1, wherein the chamber further comprises an upper annular ring, wherein a space is created between an edge of the upper annular ring and a wall of the chamber, and wherein the space restricts a flow of fluids in the chamber.

10. The apparatus of claim 9, wherein the opening between the upper annular ring and either the workpiece or the chamber wall is at least 3/8 inch.

11. The apparatus of claim 1, wherein the distribution plate is located from about 1/8 inch to about 3 ½ inches from a surface of the workpiece.

12. The apparatus of claim 1, the first fluid comprises ammonia gas and the second fluid comprises hydrogen fluoride gas, the first fluid and the second fluid are adapted to react inside the chamber to form a self-limiting etchable layer on a portion of the adapted surface layer of the workpiece.

17. A distribution plate comprising:

a first plurality of channels for providing a first fluid to flow into a chamber at an angle θ_1 with respect to an exposed surface of the distribution plate; and

a second plurality of channels for providing a second fluid to flow into the chamber at an angle θ_2 with respect to the exposed surface of the distribution plate, wherein the first plurality of channels and the second plurality of channels are arranged in rings around a common point of the distribution plate, and wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees.

19. The distribution plate of claim 17, wherein paths of the first plurality of channels and the second plurality of channels originate in an XY plane of the distribution plate and wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees with respect to the XY plane and wherein each angle θ_1 is offset from the XY plane at an offset angle α_1 and β_1 with respect to the XY plane, and wherein each angle θ_2 is offset from the XY plane at an offset angle α_2 and β_2 with respect to the XY plane, and wherein α_1, β_1, α_2, and β_2 are selected from the group consisting of from about 0 to -45 and from about 0 to +45 degrees with respect to the XY plane.

20. The distribution plate of claim 17, wherein the first fluid is provided to the first plurality of channels and the second fluid is provided to the second plurality of channels without premixing of the first and second fluids.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Examiner: Lund, Jeffrie Robert

Serial No.: 10/065,879

Group Art Unit: 1763

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APPENDIX B - EVIDENCE

There is no evidence entered by the Examiner and relied upon by Appellant in this appeal.

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APPENDIX C - RELATED PROCEEDINGS

There are no proceedings identified in the "Related Appeals and Interferences" section.